



**STATE OF TENNESSEE
DEPARTMENT OF ENVIRONMENT AND CONSERVATION
DIVISION OF UNDERGROUND STORAGE TANKS**

**TECHNICAL CHAPTER 3.2
AUTOMATIC TANK GAUGING**

EFFECTIVE DATE: TBD

PURPOSE

The purpose of this technical chapter is to assist Division of Underground Storage Tanks (Division) staff in understanding the regulatory requirements for the operation, features, release detection, and record keeping requirements for underground storage tank (UST) systems which utilize Automatic Tank Gauging (ATG) for leak detection.

This technical chapter contains the current policy of the Division based on the statute and regulations governing the Tennessee Petroleum Underground Storage Tank program.

AUTHORITY

All rules referred to in this technical chapter are contained in Chapter 0400-18-01 and are available on the Division of Underground Storage Tanks website at <http://www.tn.gov/sos/rules/0400/0400-18/0400-18-01.20120307.pdf>

APPLICABILITY

This document provides technical and specific industry knowledge regarding the operation, maintenance, and release detection requirements for UST systems equipped with ATG systems. The document also provides recommended practices for inspection, discussion of common problems associated with ATG systems, and a discussion of the most common types of ATG systems utilized at UST facilities.

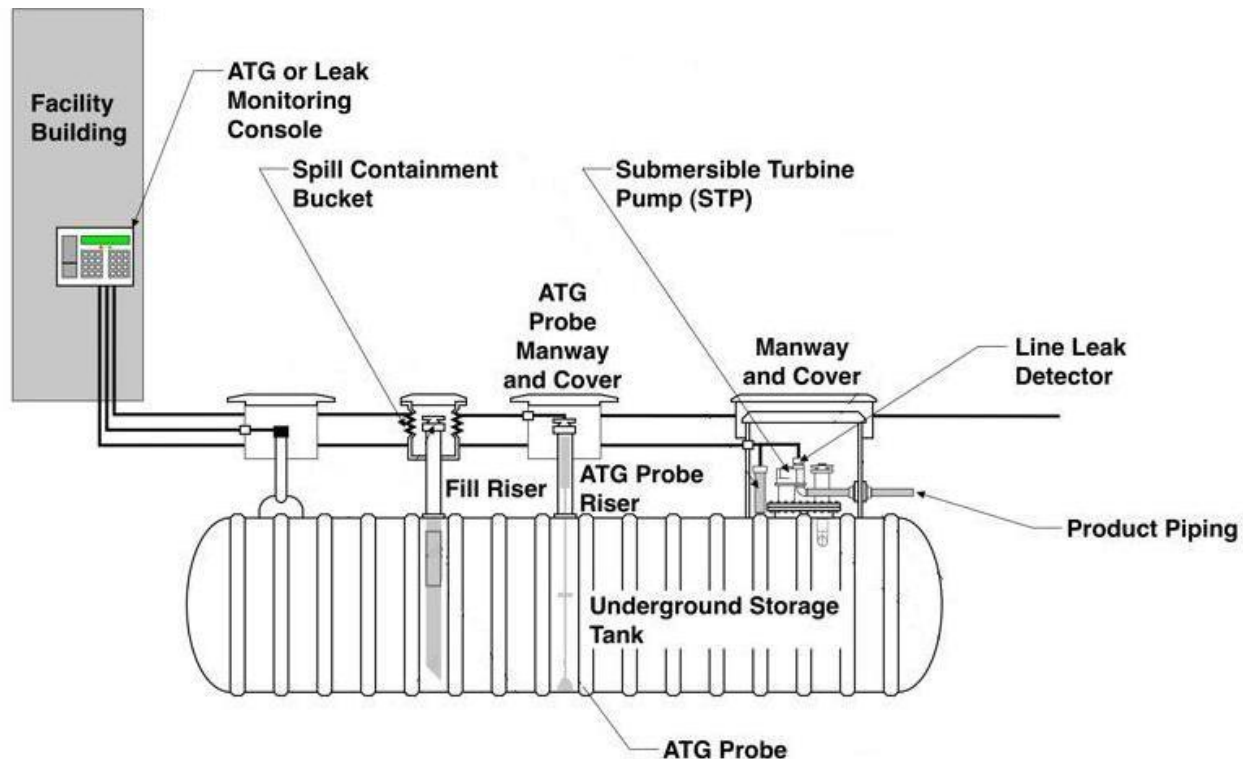
Each ATG system must be evaluated by a third party and subsequently listed by the National Work Group on Leak Detection Evaluations (NWGLDE). All ATG systems must be third party certified to test for leaks at 0.2 gph on a monthly basis, with a 95% probability of detection, with no more than a 5% probability of false alarm as required by rule .04(1)(a)3.

INTRODUCTION

ATG systems were originally developed by petroleum tank system manufacturers as a method of determining the amount of fuel in a tank without the use of a tank gauging stick. The earliest versions of ATGs were essentially gauging sticks which a facility operator could use to determine how much fuel was present in a UST system. These readings were used to conduct monthly inventory control and no additional leak testing was conducted. As technology advanced, additional features were incorporated into the device. Water level measurements, product temperature, leak

alarms, and eventually in-tank leak detection was developed and included by the Environmental Protection Agency (EPA) for use as a leak detection method.

Today there are numerous manufacturers which produce ATG systems, each with its own features and benefits. As technology in the petroleum industry has advanced, most modern UST facilities are now equipped with an ATG which can measure liquid levels within an accuracy of 1/1000th of an inch.

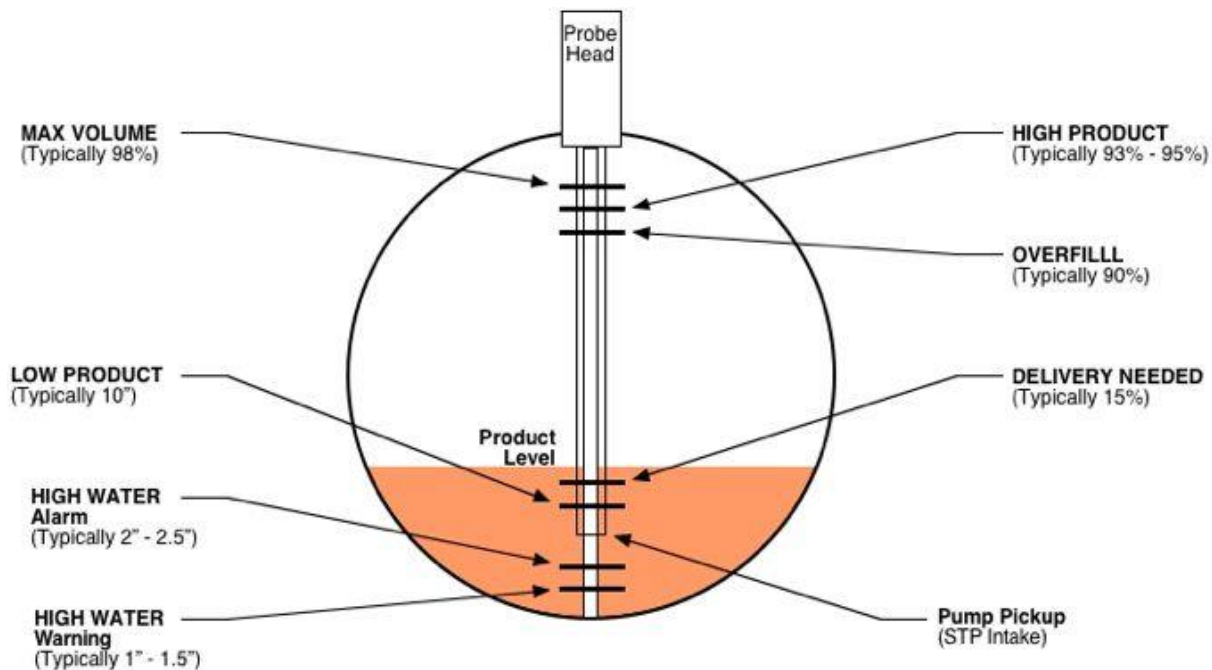


ATG systems consist of a tank probe mechanism installed in the tank that records information such as product level and temperature and a control panel inside the facility. The control panel is essentially a computer that communicates with the probes in one or multiple tank(s) as well as any sensors connected to it. The ATG console collects, interprets, and analyzes the information from the probes. Information from the ATG console is communicated to the operator via on-site or remote printer, audible/visual alarms, or a display monitor. Most ATG systems are capable of measuring the following:

- **Gross Volume**- the volume of product in the tank based on the product depth and the tank's depth to volume conversion factor.
- **Product temperature**- the average temperature of product in the tank.
- **Net volume**- temperature-compensated volume of product (calculated at 60 degrees Fahrenheit).
- **Water level**- the amount of water in the tank in inches/gallons.
- **Product level**- amount of the product in the tank in inches/gallons.
- **Ullage**- the capacity of the tank minus the gross volume of product, or empty space above the product level (usually expressed in gallons).

- **Net delivered product volume**- an automatic calculation of delivery volume based on before and after product level and temperature measurements. This volume is temperature compensated to 60 degrees F of product delivered.
- **Leak test result**- the results of the most recent as well as past leak tests. The result of a leak test may be PASS, FAIL, INVALID, INCREASE, or TEST ABORTED, etc. Some ATG systems may include the term SLOPE which is equivalent to the calculated leak rate.

ATG systems can be programmed to send audible/visual alarms when various problems exist. Most models include the following alarms:



DEFINITIONS:

Continuous In-Tank Leak Detection System (CITLDS): acronym used by Warren Rogers Associates for CITLDS, which is a third party approved leak detection method utilizing an ATG to collect multiple points of data for in-tank leak detection at high throughput facilities. These systems are designed to operate continuously while the tank is in normal operation.

Continuous Statistical Leak Detection (CSLD): another term also used to refer to continuous ATG systems.

Leak Rate: a positive number expressed in gallons per hour (gph), measured by the test device that indicates the amount of product that may be leaking out of the tank system. A negative number may indicate that something was being added to the tank (delivery) or may be caused by a thermal effect due to product expansion.

Leak Threshold: the measured leak rate at which an ATG system determines the tank to be leaking. The leak threshold will always be less than or equal to the leak rate requirement for the ATG system. For typical ATG systems, the leak rate is set at 0.2 gph and the leak threshold is set at 0.1 gph.

Statistical Continuous Automatic Leak Detection (SCALD): acronym used by INCON (Franklin Fueling) ATG systems.

Tank Capacity: the volume of product a tank will hold in gallons. Tank capacities are reported as “nominal” capacities which means the true capacity may be smaller or larger due to allowable tolerances in manufacturers’ processes.

Test Period: the length of the leak test as determined by the third party evaluation. This is only applicable to static testing.

Ullage: the portion of unfilled space above the liquid level in an underground storage tank, usually expressed in gallons.

Waiting Time: minimum amount of time between fuel deliveries or dispensing before a leak test can begin.

90% Ullage: tank specific fuel level that the ATG system uses as a target threshold to ensure that tank overfills do not occur. This level is set at 90% of the entire tank capacity.

COMPONENTS OF AUTOMATIC TANK GAUGING SYSTEMS

- 1) Console- see photos on page 9.
- 2) Probe Types

For these types of ATG systems to operate properly, all leak tests must be performed during a period when no fuel is added to or removed from the tank.

a. Magnetostrictive

A magnetostrictive probe works on the principle that sound maintains a constant velocity despite temperature differences that may occur along its route of travel. When this principle is employed in an ATG system, a vertical pipe is installed in the tank. A wire runs down the center of the full length of the pipe. Around the outside of the pipe is a doughnut-shaped float that contains a strong magnet. Magnetic flux from this floating magnet impinges on the wire at the liquid level in the tank. For measurement of this level, a sound wave is injected into the top end of the wire and when the sound wave reaches the level of the magnetic float, the vibration of the wire causes electricity to be generated in the wire. With repeated calculation of the time between the start of the sound pulse and the start of the subsequent electrical pulse, the precise level of the float can be determined.

b. Capacitance

Certain ATG systems utilize capacitance type liquid measurement as a means of detecting changes in the depth of liquid in a storage tank. A hollow metal tube, with a smaller electronic tube running down its center, is installed vertically in an underground storage tank. The outside surface of the inside tube and the inside surface

of the outside tube form the two plates of a capacitor. The space between them is a dielectric that serves essentially as an insulator between the two plates.

The outer tube is open at the bottom, and liquid in the tank rises in this tube. A small electric charge is stored on the inner tube. This electric charge seeks to pass through the dielectric to the opposite plate represented by the outer tube of the probe. Air (where no liquid is present) may be assigned a dielectric value of 1.

Gasoline, on the other hand, could be assigned a dielectric value of 2. Thus, the electric charge on the inner tube encounters a different resistance when it seeks to pass through the air than when it seeks to pass through the gasoline. The capacitance probe is capable of precisely sensing the amount of air versus the amount of liquid fuel present between the tubes.

This electronic property is then converted to a measurement of the liquid level in the tank.

The measurement is translated on a gauging instrument, outside the tank, to the volume of liquid present in the tank. When set in a leak detection mode, over a period of time the system can detect the presence of a leak in the tank.

Capacitance probes do not work with ethanol blended fuels.

c. Ultrasonic

A sensor detects sound wave echoes reflected from an interface of water/fuel or fuel/air to calculate the liquid level based on the speed of sound in the media.



Ultrasonic Probe

d. Mass measurement

Mass buoyancy probes operate on the Archimedes Principle, and measure the weight of a probe or load cell suspended in the fuel during the test period. Any changes in the weight of the suspended object can be converted to a volume change and the amount of fuel (in gallons/inches) in the tank can be determined. Mass buoyancy ATG measurements are not affected by changes in product temperature. However, they require a test period when nothing is added to or removed from the tank.

TYPES OF MONITORING METHODS FOR AUTOMATIC TANK GAUGING SYSTEMS

1) Static

This method is typically done by taking the tank out of service and putting the ATG into test mode on a monthly basis at a minimum. ATGs can be programmed to run static tests at any time. If a static test is being conducted and a consumer attempts to purchase fuel, it will invalidate the test result. The ATG might interpret this as a sudden loss. If a test has not been conducted at the end of the month, a tank owner has no monthly record for their release detection. See rule .04(3)(d)2. (See Appendix 1 for ATG reference guide).

2) Continuous

These systems may use different techniques; however, they share the characteristic of monitoring tank data continuously for days, weeks, or months, and then providing leak detection capabilities on demand once the initial data requirements are met. They may use many data items, including product height, product temperature, presence or depth of water, the tank chart or geometry, meter readings, delivery records, etc, collected continually. The advantage of using CITLDS is that tank systems using this method do not have to be taken out of service each month to conduct a static test. See rule .04(3)(d)3. CITLDS uses an ATG to collect product level measurements, and employs three different techniques to generate results.

Three techniques are described in the *Evaluation Protocol for Continuous In-Tank Leak Detection Systems Revision 1* dated January 7, 2000.

a. Continuous Automatic Tank Gauging

These systems use an ATG probe to collect data continually and combine this with software to identify time intervals when there is no activity in the tank and the data are stable enough for analysis. An algorithm then combines data from a number of such periods until there is enough evidence to make a determination about the leak status of the tank. This type of system functions like an ATG except that it does not require that the tank be taken out of service for a set period of several hours whenever a test is to be done. Instead, it uses data from shorter stable time periods and combines the results to estimate a leak rate and perform a test. The system may default to a standard or shut down ATG test (requiring the tank to be out of service for a few hours) at the end of the month if sufficient good quality data have not been obtained over the month.

Continuous ATGS may use the same probe in a tank as a similar ATG to collect temperature and level measurements and report them to a console. However, whereas an ATG requires a specified waiting time after a delivery and a further period of no dispensing or delivery operations while it conducts a leak test (a shut down period), the Continuous ATGS is designed to avoid such specified shut downs of normal tank operation. It does this by collecting data continuously. The software identifies segments of stable data, stores these data, and combines numerous such segments to produce a leak rate estimate that is used to determine whether the tank is tight or not. For high use tanks, a period of several days or weeks may be needed for the system to

acquire sufficient data to make its determination. Once an adequate data base is obtained, a test can be conducted at any time by operator request. The test is based on the most recent data available. As new data are accumulated, older data are dropped, so that the leak rate estimate and test are based on the most current data. The total duration of the test period and the amount of data actually used in calculations will vary with the tank use pattern, the type of test being run (e.g., monthly or annual), and the quality of the current data.

b. Continuous In-Tank Leak Detection Systems (Continual Reconciliation)

These systems combine continuous product level and temperature monitoring from the tank with data from dispensing meters. Data from delivery records may also be included. In addition, these systems may address leaks or unexplained losses of product from the tank vessel, the pressurized lines, or a combination to monitor the tank and line system. These systems allow a combination of monitoring data from a static tank and inventory data from a dynamic tank to be combined in monitoring the system for a leak.

Continual reconciliation systems are related to statistical inventory reconciliation (SIR) systems. However, while SIR uses daily inventory records in the statistical analysis, the continual reconciliation systems use much more frequent inventory data. In addition, the continual reconciliation system may use initial data to develop a meter map, identifying meters with the tanks they draw product from. Furthermore, the continual reconciliation system may use data from the first month or so to do a tank calibration for each specific tank, providing a more accurate analysis of the data. Thus, the continual reconciliation systems differ from SIR systems in collecting and using more data from the tank records and in using much more frequent reconciliations as well as collecting some of the data automatically while also allowing for manual input.

REQUIREMENTS

An owner/operator is required to maintain documentation that the ATG system has performed at least one 0.2 gph leak test per month (i.e., every 30 days) for the previous 12 months. See rule .04(3)(d)2. and 3. Also, during an inspection performed by Division personnel, the ATG console must be accessible and an authorized representative who is familiar with operation of the ATG system must be present to generate inventory and setup reports every six years or if a problem is identified onsite (i.e. low product level) which will require a follow-up inspection with setup provided thereafter as required by rule .03(2).

The Division recommends that all UST inspectors obtain a copy of the EPA document “Automatic Tank Gauging Systems for Release Detection: Reference Manual for Underground Storage Tank Inspectors”. This document has been provided to every tank owner by the Division on the Annual Compliance Tool Box CD under Helpful Information, EPA Publications, Automatic Tank Gauge systems. The manual is also available on EPA’s website at www.epa.gov/swerust1/pubs/automati.htm

Examples of Automatic Tank Gauging Consoles



Veeder Root TLS-350



Veeder Root TLS-450



Incon Tank Sentinel (TS-1001)



Incon Tank Sentinel (TS-5000, TS-5)



Omntec OEM 4000



OPW EECO 1500



Red Jacket ST 1400



Pneumercator TMS 3000

COMMON PROBLEMS ASSOCIATED WITH ATG SYSTEMS



1) **24-Hour UST Systems**

High throughput or unmanned facilities frequently dispense fuel 24 hours a day and may not be capable of completing a 0.2 gph test. A common problem is that the ATG needs a minimum amount of “quiet time” where no fuel is delivered or dispensed in order to run a valid test. It may not be possible to get a valid test at a UST system open 24 hours a day. If a UST system is accessible 24 hours a day, then there should be enough “quiet time” to allow the ATG system to perform a valid leak test at least once per month.

2) **Alarms Not Properly Investigated**

Owners and operators must address any alarms from the ATG system. During a UST Operations Inspection, Division staff should visually inspect the ATG console to verify there are no active alarms that have not been investigated. If any leak detection records are missing or incomplete, then the inspector must request a copy of the ATG system in-tank alarm history report to confirm there are no ongoing problems which require investigation. See rule .03(2). Examples of alarm history reports from various ATG consoles are shown in later sections of this technical document. Failure to properly investigate leak alarms and report suspected releases to the Division within 72 hours is a violation of rule .03(2)(a)2. and .05(1)(a)3.

3) **Monthly Leak Test Reports Not Maintained**

Even if a facility is equipped with an ATG, it does not guarantee compliance. Some tank owners rely on the ATG console’s internal memory to store these records, and generate them upon request with a Leak History report. Leak history reports are acceptable, under rules .03(2)(b)4. and .04(5)(b), but electronic component failure due to electrical shortage, storms, or hardware problems frequently allow electronically stored records to be permanently lost. Therefore, it is the Division’s recommendation that owners/operators not rely on the ATG leak history for maintaining monthly release detection records. A release could go undetected if monthly records are not reviewed. An owner/operator may be unaware if the ATG fails to produce a passing monthly record.

In addition, the Division recommends that ATG leak test reports be reviewed when they are printed on a monthly basis. If the leak report indicates a leak (i.e., failing test, etc.), then, in accordance with rules .03(2)(b)4., .04(3)(d)1.(ii), .04(3)(d)2.(ii), .04(3)(d)3.(ii), and .05(1)(a)3. the owner/operator shall report a suspected release to the Division within 72 hours.

4) Tank Owner/ Operator Unfamiliar with ATG Operation

If the facility operator is not familiar with the ATG functions, then a release may go undetected. Report any monthly failed leak test results as required by rules .03(2)(b)4., .04(3)(d)1.(ii), .04(3)(d)2.(ii), .04(3)(d)3.(ii), and .05(1)(a)3. Failure to do so may result in a civil penalty and jeopardize fund coverage for a release. An owner's manual should be available at the facility. Many ATG manuals may be downloaded from the manufacturers' websites.

5) Tank Fuel Volume Too Low for Valid Leak Test

All ATG probes are required to have a minimum product level in the tank in order to conduct a valid test in static test mode. It is possible for some ATG systems to produce passing results when the product level in the tank is below the minimum product level for a valid test. The Division does not consider tests conducted at insufficient product levels to be acceptable because rule .04(1)(a)2. requires methods of release detection to be "installed, calibrated, operated and maintained in accordance with the manufacturer's instructions, including routine maintenance and service checks for operability or running condition". The minimum product levels are specified in the NWGLDE list and the EPA ATG Reference Manual. These product levels may change based on reevaluations.

6) ATG Not Programmed Properly

Specific information that may not be programmed correctly include but may not be limited to, tank diameter and volume, tank material of construction, product type, minimum product test level, leak detection threshold, high/low product level alarms and high water alarms. A qualified technician must reprogram these parameters if they are incorrect. Consult Technical Chapter 3.5 Requirements for Pressurized Piping for piping parameters if an electronic line leak detector is being used.

Rule .04(1)(a)2. requires release detection equipment to be "installed, calibrated, operated and maintained in accordance with the manufacturer's instructions, including routine maintenance and service checks for operability or running condition".

7) Third Party Evaluation for Large Capacity or Manifolded Tank Systems

Several ATG systems have not been third party evaluated for manifolded tank systems. Each tank in a manifolded tank system is required to have a separate ATG probe unless the ATG system is also using a continuous statistical leak detection system (CSLD or SCALD). The Division will not accept leak test reports from ATG systems that are not third party certified for the tank size the ATG system is monitoring as required by rules .04(1)(a)3., .04(3)(d)2.(ii), and .04(3)(d)3.(ii).

8) ATG System Not Routinely Inspected

Manufacturers recommend routine inspection and maintenance of equipment to ensure proper operation and detect deterioration of the probes, wiring or floats. And, ATG systems must be “maintained in accordance with the manufacturer’s instructions” as required by rule .04(1)(a)2. However, we do not require verification of routine periodic maintenance even if required by the manufacturer.

9) ATG Leak Threshold Set Incorrectly

The Division considers any leak threshold for monthly monitoring to be 0.1 gph. Any passing test result with a leak threshold greater than 0.1 gph is an invalid test result. A qualified technician must reprogram the leak threshold to 0.1 gph.

10) ATG used for Tank Tightness Testing

ATGs may not be used for tank tightness testing because they do not consider groundwater levels as required by rule .04(3)(c)2., and are not capable of testing the ullage space.

11) Probes with Ethanol-blended Fuels

Traditional water floats used on ATGs will not detect water incursion into a tank containing ethanol-blended fuels. This is problematic in that it does not provide any warning to the tank owner about increasing water levels in the fuel. Although not required, tank owners are encouraged to monitor the tank at least monthly with a gauging stick and water finding paste designed for use with ethanol-blended fuels. Some floats are available that will detect the phase separation layer.

12) Submittal of Inaccurate Records

Ensure records are for the correct facility. The ATG console must be accessible during the inspection and an authorized representative who is familiar with operation of the ATG system must be present to generate inventory and setup reports every six years or if a problem is identified onsite (i.e. testing at product level below third party certification, improper tank size for test) which will require a follow-up inspection with setup provided thereafter. If only the leak history (not monthly records) was provided in records submittal, then the leak history should be again printed off during the onsite inspection.

REASONS WHY TANK LEAK TESTS FAIL

1) An actual leak has occurred.

2) Temperature instability

Temperature variations of the product within the tank after a fuel delivery are the most common source of interference and failed leak tests/false alarms (a false positive or failure to

detect an actual leak). Look at the hourly temperature data on the leak test report and retest if the variation in temperature is more than a few tenths of a degree. If leak test is being performed in static test mode, then do not begin the leak test until a sufficient period of time has passed since a fuel delivery has occurred. This period is called “waiting time” and is found in the NWGLDE listing for each ATG system.

3) Large changes in product temperature from the beginning to the end of the test.

This could be reported as an invalid test or as a failed leak test result.

4) Water level changes from the beginning to the end of the test.

5) Tank Deformation

The tank changes shape after a large product delivery.

6) Tank Cross-Talk

The fuel level changes in one tank causes a level change in an adjacent tank or compartment in manifolded tanks or compartments.

7) Product is being dispensed during a leak test.

RECORDKEEPING

Rules .03(2)(b)4. And .04(5)(b) require that the previous 12 months of monthly 0.2 gph leak test results for each tank be properly maintained and be available for Division review. The Division also requires under rule .03(2), that someone who is familiar with the operation of the ATG system be present during an inspection and be able to generate the following information for review to ensure the ATG system is operational:

TYPES OF REPORTS

The following are examples of reports that may be generated.

1) In-Tank Inventory

<p>INCON INTELLIGENT CONTROLS INC P.O. BOX 638 SACO ME 040722</p> <p>08/11/1998 7:26 PM</p> <p>PRODUCT INVENTORY DETAIL</p> <p>UNLD REG 11882.3 GAL</p> <p>TANK 1</p> <p>GROSS 7125.3 GAL NET 7067.0 GAL DAYS SUPPLY 3.7 DAYS ULLAGE 4150.1 GAL WATER VOLUME 12.7 GAL</p> <p>UNLD PLUS 5092.7 GAL</p> <p>TANK 2</p> <p>GROSS 2033.3 GAL NET 2015.9 GAL DAYS SUPPLY 5.3 DAYS ULLAGE 2804.8 GAL WATER VOLUME 0.0 GAL</p>	<p>INVENTORY REPORT</p> <p>T 1:BLUE 1</p> <p>VOLUME = 1245 GALS ULLAGE = 2755 GALS 90% ULLAGE= 2355 GALS TC VOLUME = 1230 GALS HEIGHT = 22.36 INCHES WATER VOL = 0 GALS WATER = 0.00 INCHES TEMP = 76.2 DEG F</p> <p>T 2:BLUE 2</p> <p>VOLUME = 1674 GALS ULLAGE = 2326 GALS 90% ULLAGE= 1926 GALS TC VOLUME = 1653 GALS HEIGHT = 27.89 INCHES WATER VOL = 0 GALS WATER = 0.00 INCHES TEMP = 77.2 DEG F</p>
Incon TS-1000 Inventory Report	Veeder Root TLS-350 Inventory Report
<p>A current inventory report for each tank should be reviewed during UST inspections to determine the presence of water in the tank and to properly identify each tank probe by name and product type.</p>	

2) Static Leak Test (0.2 or 0.1 gph)

<pre> INCON INTELLIGENT CONTROLS INC P. O. BOX 638 SACO ME 04072 1-800-984-6266 10/10/1997 02:12 LEAK TEST REPORT PLUS 2 5014.3 GAL PLUS LEAK TEST 0.100 G/H LEAK THRESHOLD 0.050 G/H CONFIDENCE LEVEL 99.0% TEST STARTED 21:45 TEST STARTED 10/12/1997 GROSS CAPACITY 56.12% BEGIN GROSS 2814.2 GAL BEGIN NET 2808.8 GAL BEGIN LEVEL 52.630 IN BEGIN TEMP 62.720 F BEGIN WATER 0.4 GAL BEGIN WATER 0.130 IN END TIME 2:39 END DATE 10/10/1997 END GROSS 2814.3 GAL END NET 2808.6 GAL END LEVEL 52.632 IN END TEMP 62.870 F END WATER 0.4 GAL END WATER 0.131 IN HOURLY DATA TIME DEG F GAL 22:44 62.721 2809.23 23:44 62.751 2808.70 0:44 62.805 2809.07 1:44 62.883 2809.03 SLOPE -0.04 GAL/HR SLOPE LOW -0.04 GAL/HR SLOPE HIGH -0.04 GAL/HR TEST RESULTS PASSED SLOPE EQUALS CALCULATED LEAK RATE </pre>	<pre> MMM DD, YYYY HH:MM XM LEAK TEST REPORT T 1: REGULAR UNLEADED PROBE SERIAL NUM 105792 TEST STARTING TIME: MM DD, YYYY HH:MM XM TEST LENGTH = 4.3 HRS STRT VOLUME = 3725 GALS LEAK TEST RESULTS 0.2 GAL/HR TEST PASS </pre>
Incon TS-1000 Leak Test Report (static)	Veeder Root TLS-350 Leak Test Report

3) Continuous (CSLD or SCALD) Leak Test

<pre> INCON INTELLIGENT CONTROLS INC P.O. BOX 638 SACO ME 040722 08/13/1998 10:16 AM SCALD TEST REPORT TANK 1 11882.3 GAL (PRODUCT NAME) LEAK TEST 0.200 GPH LEAK THRESHOLD 0.100 GPH EXTENT 18.0 HRS VOL QUALIFY 0.0% TEST STARTED 12:22 PM TEST STARTED 08/07/1998 SALES RATE 54.731 GPH EVAPORATED 1.781 GAL LOST 0.327 GAL DUTY FACTOR 0.31 UPDATED 12:40 AM UPDATED 08/10/1998 SLOPE -0.002 GAL/HR TEST RESULT PASSED SLOPE EQUALS CALCULATED LEAK RATE </pre>	<pre> CSLD TEST RESULTS ----- DD-MM-YY HH:MM XM T 2: SUPER UNLEADED PROBE SERIAL NUM 123002 0.2 GAL/HR TEST PER: DD-MM-YY PASS </pre>
Incon SCALD Leak Test Report	Veeder Root CSLD Leak Test Report

4) Tank Test Leak History

<p>TANK LEAK TEST HISTORY</p> <p>T 1:Unleaded</p> <p>LAST GROSS TEST PASSED: NOV 4, 1996 12:01 AM STARTING VOLUME= 17559 PERCENT VOLUME = 89.1 TEST TYPE = STANDARD</p> <p>LAST ANNUAL TEST PASSED: NO TEST PASSED FULLEST ANNUAL TEST PASS NO TEST PASSED</p> <p>LAST PERIODIC TEST PASS: SEP 29, 1998 2:54 AM TEST LENGTH 17 HOURS STARTING VOLUME= 11434 PERCENT VOLUME = 58.0 TEST TYPE = CSLD</p> <p>FULLEST PERIODIC TEST PASSED EACH MONTH:</p> <p>JAN 31, 1998 3:19 AM TEST LENGTH 18 HOURS STARTING VOLUME= 12276 PERCENT VOLUME = 62.3 TEST TYPE = CSLD</p> <p>FEB 28, 1998 4:29 AM TEST LENGTH 19 HOURS STARTING VOLUME= 14183 PERCENT VOLUME = 72.0 TEST TYPE = CSLD</p> <p>MAR 31, 1998 3:37 AM TEST LENGTH 19 HOURS STARTING VOLUME= 14377 PERCENT VOLUME = 73.0 TEST TYPE = CSLD</p>	<p>INCON INTELLIGENT CONTROLS INC P.O. BOX 638 SACO ME 040722</p> <p>08/13/1998 10:16 AM</p> <p>REGULATORY REPORT</p> <p>HARDWARE STATUS</p> <table> <tr><td>TS-CIM</td><td>NOT INSTALLED</td></tr> <tr><td>TS-ROM</td><td>NOT INSTALLED</td></tr> <tr><td>TS-SEM 1</td><td>NOT INSTALLED</td></tr> <tr><td>IO MOD 1</td><td>NOT INSTALLED</td></tr> <tr><td>PRINTER</td><td>OPERATIONAL</td></tr> <tr><td>FAX/MOD</td><td>OPERATIONAL</td></tr> </table> <p>PROBES</p> <table> <tr><td>PROBE 1</td><td>OPERATIONAL</td></tr> <tr><td>PROBE 2</td><td>OPERATIONAL</td></tr> </table> <p>SENSORS</p> <table> <tr><td>SENSOR 1</td><td>OPERATIONAL</td></tr> <tr><td>SENSOR 2</td><td>OPERATIONAL</td></tr> <tr><td>SENSOR 3</td><td>OPERATIONAL</td></tr> </table> <p>LINES</p> <table> <tr><td>LINE NO. 1</td><td>OPERATIONAL</td></tr> <tr><td>LINE NO. 2</td><td>OPERATIONAL</td></tr> </table> <p>AUXILIARY INPUTS</p> <table> <tr><td>AUX IN 1</td><td>OPERATIONAL</td></tr> <tr><td>AUX IN 2</td><td>OPERATIONAL</td></tr> </table> <p>PASSED LEAK TESTS</p> <table> <tr><td>TANK 1</td><td></td></tr> <tr><td>08/26/1998</td><td>7:42 PM</td></tr> <tr><td>LEAK TEST</td><td>0.20</td></tr> <tr><td>SLOPE</td><td>-0.03</td></tr> </table> <p>(PASSED LEAK TESTS, PASSED SCALD TESTS, and PASSED LINE TEST REPORT results are all presented in the format used for the PASSED LEAK TEST for TANK 1, shown above)</p>	TS-CIM	NOT INSTALLED	TS-ROM	NOT INSTALLED	TS-SEM 1	NOT INSTALLED	IO MOD 1	NOT INSTALLED	PRINTER	OPERATIONAL	FAX/MOD	OPERATIONAL	PROBE 1	OPERATIONAL	PROBE 2	OPERATIONAL	SENSOR 1	OPERATIONAL	SENSOR 2	OPERATIONAL	SENSOR 3	OPERATIONAL	LINE NO. 1	OPERATIONAL	LINE NO. 2	OPERATIONAL	AUX IN 1	OPERATIONAL	AUX IN 2	OPERATIONAL	TANK 1		08/26/1998	7:42 PM	LEAK TEST	0.20	SLOPE	-0.03
TS-CIM	NOT INSTALLED																																						
TS-ROM	NOT INSTALLED																																						
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LEAK TEST	0.20																																						
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Veeder Root Leak History Report	INCON Regulatory Report																																						

5) In-Tank Setup

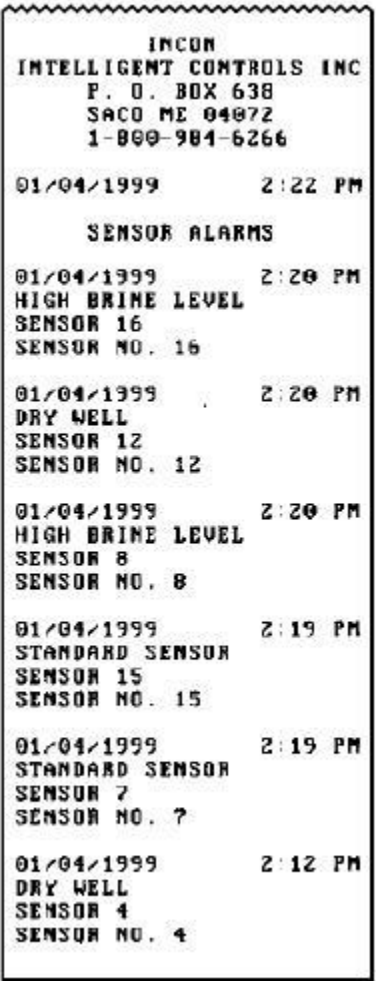
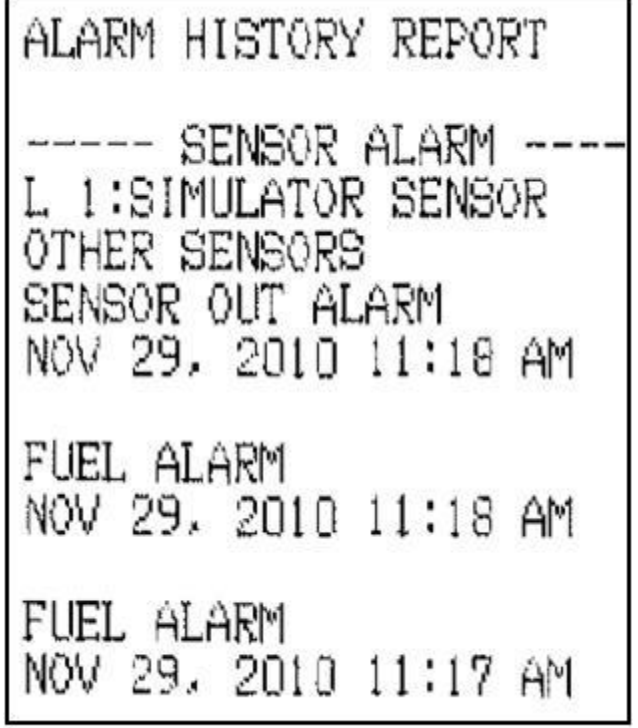
<pre> IN-TANK SETUP ----- T 2:DIESEL PRODUCT CODE : 2 THERMAL COEFF :.000450 TANK DIAMETER : 120.00 TANK PROFILE : 4 PTS FULL VOL : 19947 90.0 INCH VOL : 16201 60.0 INCH VOL : 9974 30.0 INCH VOL : 3746 METER DATA : YES END FACTOR : NONE CAL UPDATE : NEVER FLOAT SIZE: 4.0 IN. WATER WARNING : 3.0 HIGH WATER LIMIT: 3.5 MAX OR LABEL VOL: 19947 OVERFILL LIMIT : 90% : 17952 HIGH PRODUCT : 95% : 18949 DELIVERY LIMIT : 10% : 1994 LOW PRODUCT : 1500 LEAK ALARM LIMIT: 99 SUDDEN LOSS LIMIT: 999 TANK TILT : 0.56 PROBE OFFSET : 0.00 SIPHON MANIFOLDED TANKS T#: NONE LINE MANIFOLDED TANKS T#: NONE LEAK MIN PERIODIC: 20% : 3989 LEAK MIN ANNUAL : 20% : 3989 PERIODIC TEST TYPE STANDARD ANNUAL TEST FAIL ALARM DISABLED PERIODIC TEST FAIL ALARM DISABLED GROSS TEST FAIL ALARM DISABLED ANN TEST AVERAGING: OFF PER TEST AVERAGING: OFF TANK TEST NOTIFY: OFF TNK TST SIPHON BREAK:OFF DELIVERY DELAY : 5 MIN PUMP THRESHOLD : 10.00% </pre>	
TLS-350 In-Tank Setup Report	

6) In-Tank Alarm History

<p>ALARM HISTORY REPORT</p> <p>----- IN-TANK ALARM -----</p> <p>T 5:GOLD 2</p> <p>SETUP DATA WARNING JAN 1. 1994 8:20 AM</p> <p>LOW PRODUCT ALARM SEP 2. 2010 12:36 PM SEP 1. 2010 3:27 PM AUG 19. 2010 12:07 PM</p> <p>INVALID FUEL LEVEL SEP 2. 2010 12:36 PM AUG 31. 2010 5:36 PM AUG 19. 2010 12:06 PM</p> <p>PROBE OUT MAR 12. 2009 1:25 PM</p> <p>DELIVERY NEEDED JAN 1. 1994 8:21 AM</p> <p>PERIODIC TEST FAIL SEP 2. 2010 2:14 PM AUG 26. 2010 7:03 PM AUG 19. 2010 12:09 PM</p>	<div data-bbox="938 226 1312 1360" style="border: 1px solid black; padding: 5px;"> <p style="text-align: center;">INCON INTELLIGENT CONTROLS INC P. O. BOX 638 SACO ME 04072 1-800-384-6266</p> <p>01/09/2000 1:54</p> <p style="text-align: center;">TANK ALARMS</p> <p>01/09/2000 0:23 HIGH WATER TANK NO. 3</p> <p>01/09/2000 0:18 HIGH PRODUCT LIMIT TANK NO. 2</p> <p>01/04/2000 21:12 HIGH WATER TANK NO. 3</p> <p>01/04/2000 21:07 HIGH PRODUCT LIMIT TANK NO. 4</p> <p>01/04/2000 21:06 HIGH WATER TANK NO. 1</p> <p>01/04/2000 20:57 HIGH PRODUCT LIMIT TANK NO. 1</p> <p>01/04/2000 20:55 HIGH PRODUCT LIMIT TANK NO. 1</p> <p>01/04/2000 20:36 HIGH PRODUCT LIMIT TANK NO. 2</p> <p>01/02/2000 18:36 HIGH WATER TANK NO. 3</p> <p>12/09/1998 0:04 HIGH WATER TANK NO. 1</p> </div>
Veeder Root Alarm History Report	INCON In-Tank Alarm History

The in-tank alarm history report will indicate whether any failed test results were recently generated by the ATG. This report must be provided to inspectors onsite when there are missing or incomplete ATG leak test reports.

7) Sensor Alarm History

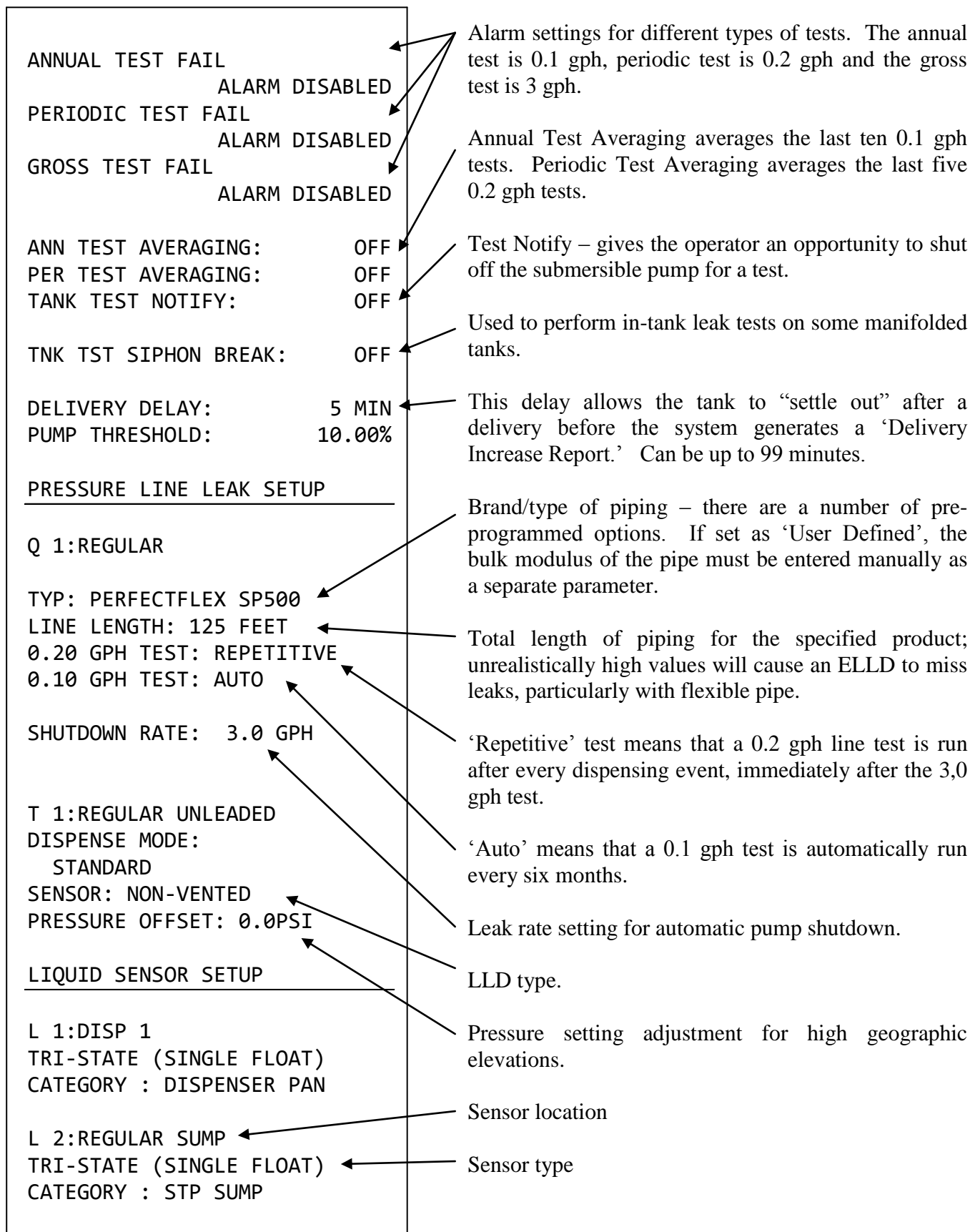
 <p>INCON INTELLIGENT CONTROLS INC P. O. BOX 638 SACO ME 04072 1-800-984-6266</p> <p>01/04/1999 2:22 PM</p> <p>SENSOR ALARMS</p> <p>01/04/1999 2:20 PM HIGH BRINE LEVEL SENSOR 16 SENSOR NO. 16</p> <p>01/04/1999 2:20 PM DRY WELL SENSOR 12 SENSOR NO. 12</p> <p>01/04/1999 2:20 PM HIGH BRINE LEVEL SENSOR 8 SENSOR NO. 8</p> <p>01/04/1999 2:19 PM STANDARD SENSOR SENSOR 15 SENSOR NO. 15</p> <p>01/04/1999 2:19 PM STANDARD SENSOR SENSOR 7 SENSOR NO. 7</p> <p>01/04/1999 2:12 PM DRY WELL SENSOR 4 SENSOR NO. 4</p>	 <p>ALARM HISTORY REPORT</p> <p>----- SENSOR ALARM -----</p> <p>L 1:SIMULATOR SENSOR OTHER SENSORS SENSOR OUT ALARM NOV 29, 2010 11:18 AM</p> <p>FUEL ALARM NOV 29, 2010 11:18 AM</p> <p>FUEL ALARM NOV 29, 2010 11:17 AM</p>
INCON Sensor Alarm History	Veeder Root Sensor Alarm History

INTERPRETATION OF SETUP INFORMATION TO BE REVIEWED ONSITE

Setup information from the ATG will be reviewed during the onsite inspection every six years or if a problem is identified onsite (i.e. low product level) which will require a follow-up inspection with setup provided thereafter. Below are examples of setup information of commonly found for ATGs in Tennessee.

VEEDER-ROOT TLS-3XX SETUP:

SYSTEM SETUP			
JUL 05, 2010	11:51 AM		Time/date setup was printed
PETROLEUM EMPORIUM			Facility information
1234 MAIN STREET			
CENTERTOWN, TN 01234			Product Identification
IN-TANK SETUP			Product Code is related to sales/inventory tracking.
T 1:REGULAR UNLEADED			Thermal Coefficient is determined by product; this enables the ATG to take temperature related volume changes into account for leak tests. An incorrect value can cause test failures.
PRODUCT CODE	1		
THERMAL COEFF	.000700		
TANK DIAMETER	120.00		
TANK PROFILE	1 PT		Tank Diameter / Tank Profile – these tank geometry parameters determine the ‘tank chart’ the ATG will use to convert depths into volumes.
FULL VOL	15245		
FLOAT SIZE	4.0 IN.		
WATER WARNING	2.0		Water Warning / High Water Limit – the ATG alerts the operator of the presence of water as the specified depths.
HIGH WATER LIMIT	3.0		
MAX OR LABEL VOL	15245		
OVERFILL LIMIT	90%		Overfill Limit / High Product – the ATG alerts the operator to the presence of fuel in excess of these amounts. They differ in that the ‘Overfill Limit’ is triggered by fuel deliveries, while ‘High Product’ can be used to recognize slow increases (e.g., in used oil applications)
HIGH PRODUCT	13720		
	95%		
	14482		
DELIVERY LIMIT	10%		Delivery Limit – typically, the level at which the ATG alerts the operator to order a fuel delivery.
	1524		
LOW PRODUCT	700		Leak Alarm Limit – warns the operator of a large loss rate (>1 gph) during a leak test
LEAK ALARM LIMIT	99		
SUDDEN LOSS LIMIT	99		Sudden Loss Limit – warns the operator of a large loss volume loss (>25 gallons) during a leak test
TANK TILT	0.00		Tank Tilt / Probe Offset – these parameters modify the tank chart for variations in tank and probe positioning.
PROBE OFFSET	0.00		
PERIODIC TEST TYPE	STANDARD		Possible settings are ‘Standard’ and ‘Quick.’ Quick runs a 0.2 gph test in one hour, standard takes two hours.



INCON TANK SENTINEL SETUP:

PETROLEUM EMPORIUM 1234 MAIN STREET CENTERTOWN, TN 01234		
JUL 05, 2010 11:51 AM		
SYSTEM SETUP REPORT		
LIMITS		
LEAK LIMIT		2.00
LEAK LIMIT O/G		NONE
THEFT LIMIT		10.00
THEFT LIMIT O/G		NONE
TANK		
NUMBER OF TANKS		2
TANK 1		
NAME	REG UNL	
TANK SHAPE	HORIZONTAL	
TANK TYPE	SPECIAL 1	
PROBE	PROBE 1	
PRODUCT	PRODUCT 1	
MANIFOLD	NONE	
PROD OFFSET	0.000	
WATER OFFSET	-0.816	
DEL THRESHOLD	200	
HIGH HIGH LIM	118.000	
HIGH HIGH O/G	NONE	
HIGH LIMIT	116.000	
HIGH LIMIT O/G	NONE	
LOW LIMIT	500.0	
LOW LIMIT O/G	NONE	
LOW LOW LIMIT	400.0	
LOW LOW O/G	NONE	
WATER LIMIT	3.000	
WATER O/G	NONE	

Facility information and date of system setup report.

Leak limit is a parameter that checks for fuel loss when the facility is shut down; whereas, theft limit checks for excess fuel being removed while fuel is being dispensed. The O/G or output group parameters tell the tank monitor what action to take (i.e. sound an alarm, send an email, etc.). O/G is typically set at "none" or a letter between A and FF.

Number of tanks at this facility.

Special 1, Probe 1, and Product 1 correspond to various tank, probe and product parameters listed in a different portion of the setup report

Product and/or water offset are used to compensate for product/water reading from tilted tanks

Del Threshold = minimum volume added to tank before delivery is reported on ATG

High Limit and High High Limit represent various degrees of tank fullness with High High representing the fullest level (typically set in inches of product)

High High O/G, High Limit O/G, Low Limit O/G, Low Low O/G and Water O/G represent the actions that the tank monitor takes if any of these conditions exists. For example, the ATG might sound and alarm, email the contact person, do nothing, etc. Value entered is either "none" or a letter between A and FF.

Low Limit and Low Low Limit represent various degrees of tank emptiness with Low Low representing the lowest level of product in a tank (typically set in gallons of product)

Water limit represent the water level (in inches) needed to trigger a high water alarm

SPECIAL TANKS			
SPECIAL 1			
DIAMETER		120.000	
LENGTH		205.700	
CORRECTION POINTS		0	
PROBES			
PROBE 1			
TYPE		STD 125	
GRADIENT		8.99634	
RATIO	1:1 TIP TO HEAD		
FLOATS		2 FLOATS	
FLOAT TYPE		GASOLINE	
PRODUCTS			
PRODUCT 1			
NAME		REG UNL	
TYPE		UNLEADED REG	
LINES			
NUMBER OF LINES			2
LINE 1			
NAME		LINE 1	
TEST FAIL O/G		NONE	
TEST FAULT O/G		NONE	
LINE 2			
NAME		LINE 2	
TEST FAIL O/G		NONE	
TEST FAULT O/G		NONE	

Special Tanks contains tank specific dimension and correction factors. Correction points allows the ATG to adjust fuel reading to match data for that tank. For example, you may put 500 gallons of product in a tank, but the tank monitor only reads 450 gallons, so a correction factor would be entered. Numerous correction factors can be entered.

Probe type is selected from a type already programmed into ATG; Gradient is entered from probe label and **is unique to each probe**; ratio corresponds to a correction factor (example, 1:8 would indicate that 1 inch of change indicated by the probe would correspond to 8 inches in the tank; typically used for ASTs; for UST should typically be 1:1); floats are either "2 Floats" or "1 Float" (2 floats corresponds to the product and water float); and float type is either "gasoline" or "oil"

Product = Unleaded Reg, Unleaded Pls, Unleaded Xtr, Unleaded Sup, Diesel, Kerosene, #2 Fuel Oil, Ethanol, or Special (additional information needed if product type is "special")

Number of lines, the line names, and what actions the ATG needs to take in the event of fail (i.e. alarm, etc.) or test fault. Test faults are typically related to computer glitches which cause the test to not run properly.

LEAK TEST		
CONFIDENCE		99.0%
MIN TEST TIME		2
MAX TEST TIME		8
LEAK TEST		
TANK 1		0.20
TANK 2		0.20
TEST SCHEDULES		
TANK 1		
SCHEDULE		DAILY
TIME		01:00 AM
TANK 2		
SCHEDULE		DAILY
TIME		01:00 AM
ALARM ON TEST FAIL		YES
SCALD TESTS		
CONFIDENCE		95.0%
LEAK TEST		0.20
INTERVAL		18
VOLUME QUALIFY		0.0%
VAPOR RECOVERY		DISABLED
SCALD ENABLED		
TANK 1		ENABLED
TANK 2		ENABLED
ALARM ON TEST FAIL		YES
TEST FAIL O/G		
TANK 1		ALL GROUPS
TANK 2		ALL GROUPS

Leak test contains data on leak rate, frequency, etc. for when the tank monitor is to perform a static leak test. For example, the setup to the left indicates that the 0.2 gph leak test will be performed daily starting at 1:00 AM. Test confidence must be greater than 95%. Min test time refers to the time needed to complete a leak test (set in hours). Ranges from approx. 2 hours for a 4,000 gallon tank to 5 hours for a 10,000 gallon tank to 8 hours for a 20,000 gallon tank. Alarm on test fail represents the action that the ATG will take in the event of a failure.

SCALD = Statistical Continuous Automatic Leak Detection performs volumetric leak tests during the quiet time between dispenses.

Interval is related to temperature compensation during the leak test (default IS 18)

Volume Qualify is the minimum liquid volume for which a leak test can be performed. Refer to the “National Work Group on Leak Detection Evaluations” website for the minimum tank volumes needed to perform a valid leak test. Should never be set at 0!

SCALD Enabled represent which tanks are performing SCALD leak detection (i.e., enable or disabled)

Test fail o/g (output group) represents the action that the ATG will take in the event of a failure. Could be “none”, A through FF, or “all groups”. All groups indicates that all actions programmed into all relay groups (i.e. A through FF) will occur.

For Veeder Root and INCON models used for CSLD, the probability of detection can be set at 95% or 99%. Any leak detection method installed after December 22, 1990 must be capable of detecting a leak rate with a probability of detection of ninety-five (95) percent and a probability of false alarm no greater than five (5) percent, in accordance with rule .04(1)(a)3.

Upon transfer of ownership, including, but not limited to, sale of the UST systems, originals and/or copies of all documents required to satisfy the reporting and recordkeeping requirements shall be transferred as required by rules .03(2)(d) and .02(7)(f), to the new owner of the USTs at the time of ownership transfer.

REPORTING

If any of the following conditions are observed, then the Division should be contacted to report a suspected or confirmed release with 72 hours as required by rule .05(1)(a):

- Results of any failed 0.1 gph or 0.2 gph leak tests from the ATG, unless the monitoring device or an associated UST component is found to be defective but not leaking, is immediately repaired, and a follow-up test does not confirm the initial result as required by rule .05(1)(a)3.
- Any in-tank alarm from the ATG which indicates a sudden or unexplained loss of product as required by rule .05(1)(a)2. Documentation of investigation of all in-tank leak alarms should be kept with the ATG leak test reports for review by Division staff.
- Any released petroleum product at the UST site or in the surrounding area (such as the presence of free product, , , or petroleum vapors in soils, basements, sewer and utility lines and nearby surface water) . See rule .05(1)(a)1.

REFERENCES

Automatic Tank Monitoring and Leak Detection Reference Manual, U.S. EPA, Region 7

Automatic Tank Gauging Systems for Release Detection: Reference Manual for Underground Storage Tank Inspectors, August 2000

Getting the Most Out of Your Automatic Tank Gauging System, EPA 510-F-98-011

Kentucky DEP UST Inspector Handbook, May 2006

Petroleum Equipment Institute

Wisconsin COMM 10 Material Approval # 20050005, Automatic Tank Gauging, Dec. 2009

Wisconsin COMM 10 Material Approval # 20020011, Incon Series, Dec. 2007

INCON TS-5 Series Operator's Manual

APPENDICES-

1. ATG Leak Detection Quick Reference Table

APPENDIX 1
ATG Leak Detection Quick Reference Table (Adapted from Wisconsin
(Updated 8-27-2013)

Note: Leak detection equipment installed in systems with greater than 10% ethanol should be free of zinc, lead, aluminum, tin or their alloys (brass, terne (lead-tin alloy)).

Manufacturer	Model	Test Type	Minimum Fill	Test Period (see comment)	Threshold	Max Capacity	Comment
Alert Technologies	SMART STICK I 2000	0.2	50%	1-15 hrs	0.1	15,000	
Andover Controls Corp.	TMU & INFINITY	0.2	50%		0.2	15,000	
		0.1	95%		0.1		
Caldwell Systems Corp.	Tank Manager ATG System	0.2	18 in.	3 hrs, 15 min		20,000	Ultrasonic probe
		0.1	95%	3 hrs, 15 min		20,000	Ultrasonic probe
EBW, Inc.	AUTOSTIK II & JR w/ 960/961 Series Probes	0.2	50%	4 hrs	0.1	15,000	Testing can be performed on one tank at a time.
	AUTOSTIK II & JR CSLD v31 or v51	0.1	95%	4 hrs	0.05	15,000	
		0.2	30%		0.07	30,000	<150K Monthly thru-put Testing can be performed on one tank at a time.
EBW, Inc.	Autostik (950 series) ONLY	0.2	10%	4 hrs	0.1	15,000	
		0.1	95%	4 hrs	0.05	15,000	
Emco Electronics	EECO TLM 1000, 3000	0.2	14%		0.1	20,000	
		0.1	95%		0.05	20,000	
Engineered Systems	ESI IMAGE	0.2	90%		0.1	15,000	
Franklin Fueling	INCON TS-5, 550, 550evo, 750, 1000, 1001, 2001, 5000, Colibri Probe: TSP-LL2	0.2	See Below	5 1/4 hrs	0.1		Test time is an average, actual times based on pre-set test condition criteria
		0.1	95%	5 3/4 hrs	0.05	15,000	
	INCON TS-5, 550, 550evo, 750, 1000, 1001, 2001, 5000, Colibri Probe: TSP-LL2	0.2 ONLY	See Below	<7 hrs	0.1	30,000	Variable based on quality of test data Maximum 3 Manifolded Tanks
	INCON TS-5, 550, 550evo, 750, 1000, 1001, 2001, 5000, Colibri SCALD	0.2	15%	Continuous	0.1	49,336	Maximum Monthly Throughput of 304,620 gallons Will not test if below minimum fill level.
	Tank Diameter = Product Required						
	24" 9" 72" 15" 120" 21"						
	36" 10.5" 76" 15.5" 126" 21.5"						
	48" 12" 84" 16.5" 132" 22"						
	52" 12.5" 96" 17.5" 144" 23.5"						
	64" 14" 108" 19"						2000 Scald
Franklin Fueling	INCON TS-5, 550, 750, 1000, 1001, 2001, 5000, Colibri Probe: TSP-LL2	0.2	See Below	5 1/4 hrs	0.1		Test time is an average, actual times based on pre-set test condition criteria
		0.1	95%	5 3/4 hrs	0.05	15,000	
	INCON TS-5, 550, 750, 1000, 1001, 2001, 5000, Colibri Probe: TSP-LL2	0.2 ONLY	See Below	<7 hrs	0.1	30,000	Variable based on quality of test data Maximum 3 Manifolded Tanks
	TS-5, 550, 750, 1000, 1001, 2001, 5000, Colibri SCALD	0.2	15%	Continuous	0.1	49,336	Maximum Monthly Throughput of 304,620 gallons Will not test if below minimum fill level.
	Tank Diameter = Product Required						
	24" 9" 72" 15" 120" 21"						
	36" 10.5" 76" 15.5" 126" 21.5"						
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Franklin Fueling	INCON TS-5, 550, 750, 1000, 1001, 2001, 5000 Probe: TSP-LL2	0.2	See Below	5 1/4 hrs	0.1		Test time is an average, actual times based on pre-set test condition criteria
		0.1	95%	5 3/4 hrs	0.05	15,000	
	INCON TS-5, 550, 750, 1000, 1001, 2001, 5000 Probe: TSP-LL2	0.2 ONLY	See Below	<7 hrs	0.1	30,000	Maximum 3 Manifolded Tanks
	TS-5, 550, 750, 1000, 1001, 2001, 5000 SCALD	0.2	15%	Continuous	0.1	49,336	Maximum Monthly Throughput of 304,620 gallons Will not test if below minimum.
	Tank Diameter = Product Required						
	24" 9" 72" 15" 120" 21"						
	36" 10.5" 76" 15.5" 126" 21.5"						
	48" 12" 84" 16.5" 132" 22"						
	52" 12.5" 96" 17.5" 144" 23.5"						
	64" 14" 108" 19"						2000 Scald

Manufacturer	Model	Test Type	Minimum Fill	Test Period (see comment)	Threshold	Max Capacity	Comment
GILBARCO, INC.	TM-2, TM-3, EMC Probe PA0238 (Capacitance)	0.2 ONLY	50%	5 hrs	All probes have a preset threshold which cannot be changed. Pass or Fail	15,000	
	TM-2, TM-3, EMC PROBE PA0264 (Capacitance)	0.2	50%	2 hrs		15,000	
	TM-2, TM-3 Probes PA0265 & PA0300 (Magnetostictive)	0.2	See Below	2 hrs		15,000	
	EMC Probes PA0265, PA0300 (Magnetostictive)	0.2	See Below	2 hrs		20,000	
	EMC W/CSLD	0.1	95%	2-3 hrs			
	Probes PA0265, PA0300 (Magnetostictive)	2 Cont.	5%	na	Will not test below minimum	45K, 37K, Manifold Aggregate 228,848 Aggregate	Throughput 227,559 single
	Tank Diameter = Product Required	Tank Diameter = Product Required	Tank Diameter = Product Required				
	24"-26"	9"	70"-79"	24"	123"-133"	42"	39"
	27"-36"	12"	80"-90"	27"	134"-143"	45"	42"
	37"-47"	15"	91"-101"	30"	144"-154"	48"	45"
Intelligent Controls	48"-58"	18"	102"-111"	33"	155"-165"	48"	51"
	58"-69"	21"	112"-122"	36"	166"-175"	51"	
	INCON TS 2000	0.2	50%		0.058	15,000	Magnetostictive or Digital Level Probes
	SCALD	0.1	95%		0.058	15,000	No probe numbers available.
L&J Environmental	MC6 1100,8100	0.2	7%			30,000	108K Maximum Monthly Throughput
	7021	0.2	50%		0.1	15,000	
Magnetek Controls		0.1	95%	6 hrs	0.2	15,000	Probe #7030
		0.1	95%	12 hrs	0.1	15,000	
Mallory Controls	IMAGE	0.2	90%		0.1	15,000	
	OEL8000II	0.2	See below	4.5 hrs	0.1	30,000	
OMNITEC Mfg.	OEL8000II W/CITLDS	0.2	12.70%	Continuous	0.1	18,000	
	Minimum product level based on tank diameter: Tank Diameter = Product Required	Tank Diameter = Product Required	Tank Diameter = Product Required				
	0-48"	12"	73-96"	20"	133 or greater = Contact OMNITEC		
	49-64"	15"	97-126"	15.5"			
	65-72"	16"	127-132"	26"			
	OEL 8000	0.2	50%		VARIABLE	15,000	Tests are manually initiated. No probe numbers available.
	Probes are Magnetostictive	0.1	95%		VARIABLE	15,000	
	Sitesentinel Site-2 or 4 inch float-Probe 924B	0.2	50%	30 Min.	0.1	20,000	System automatically determines minimum time based on test conditions being met. Test times will be longer for larger tanks.
	Sitesentinel Site-4 inch float-Probe 924B	0.1	95%	1.5 hrs	0.05	20,000	
	Sitesentinel Site-2 inch float-Probe 924B	0.1	95%	6.0 hrs	0.05	20,000	
OPW	Sitesentinel Site-4 inch float-Probe Q0400-4XX	0.2	50%	4.0 hrs	0.1	20,000	
	Sitesentinel Site-SLD	0.2	14.70%	Continuous	0.1	20,000.0	Maximum Monthly Throughput of 397,883 gallons
	SITE SENTINEL I.I.I.I.I. Touch	0.2	50%			20,000	Will not test if below minimum fill level
	SITE SENTINEL I.I.I.I.I. Touch	0.2	14%			20,000	30 & 60 Minute Test
OPW	SITE SENTINEL I.I.I.I.I. VTTT. Touch	0.2	14%			20,000	2 & 3 Hour Test
	SITE SENTINEL I.I.I.I.I. VTTT. Touch	0.1	95%			20,000	2 & 3 Hour Test
	SITE SENTINEL I.I.I.I.I. VTTT. Touch	0.1	95%			15,000	2 & 3 Hour Test
	SITE SENTINEL I.I.I.I.I. VTTT. Touch	0.1	95%			20,000	2 & 3 Hour Test
OPW	PETROSONIC III Probe 613	0.2	59%	2 hrs		15,000	
	SITE SENTINEL I.I.I.I.I. Touch	0.2	14%	2 hrs		15,000	
	SITE SENTINEL I.I.I.I.I. Touch	0.2	50%			20,000	30 & 60 Minute Test
	SITE SENTINEL I.I.I.I.I. VTTT. Touch	0.1	95%			20,000	2 & 3 Hour Test

Manufacturer	Model	Test Type	Minimum Fill	Test Period (see comment)	Threshold	Max Capacity	Comment
OPW	1500 & 2000 Probe Q0400-4XX (Magnetostictive)	0.2	5%	3.5 hrs	0.1	20,000	System automatically determines minimum time based on test conditions being met. Test times will be longer for larger tanks.
	ECCO SLD Probe Q0400-4XX (Magnetostictive)	0.1	95%	3.5 hrs	0.05	20,000	
OPW	SiteSentinel Site-2 or 4 inch float-Probe 924B	2 Cont.	9%			2 Tank Max	SLD 130K Maximum Throughput
	SiteSentinel Site-4 inch float-Probe 924B	0.2	50%	30 min	0.1	20,000	
	SiteSentinel Site-2 inch float-Probe 924B	0.1	95%	1.5 hrs	0.05	20,000	
	SiteSentinel Site-4 inch float-Probe Q0400-4XX	0.1	95%	6.0 hrs	0.05	20,000	
	SiteSentinel Site-4 inch float-Probe Q0400-4XX	0.2	50%	4.0 hrs	0.1	20,000	
P C Interactive	AINLAY TANK MASTER	0.2	50%		0.05	75,000	System automatically determines minimum time based on test conditions being met. Test times will be longer for larger tanks.
	TANK MASTER JR	0.2	20%		0.05	30,000	
Pneumecator Co. Inc	TMS2000 & TMS3000 Probe 450S or 7100 (Magnetostictive)	0.2	20%	2 hrs	0.1	20,000	Pneumecator probe number 450S is the same as the Anetek Patriot 7100 probe used in the 3rd-party evaluation
	>20K	0.1	95%*	7 hrs	0.05	20,000	
Pneumecator Co. Inc	TMS2000 & TMS3000 (Magnetostictive)	0.2	50%	8 hrs	0.1	75,000	Pneumecator probe number 450S is the same as the Anetek Patriot 7100 probe used in the 3rd-party evaluation
	<20K Probe 450S or 7100	0.1	20%	2 hrs	0.1	20,000	
	>20K	0.1	95%*	7 hrs	0.05	20,000	
	>20K	0.2	50%	8 hrs	0.1	75,000	
Ronan Engineering	API/IRONAN	0.2	10%		0.1	15,000	Ultrasonic Probes
	US Test Model 2001	0.1	95%	30 min	0.1	15,000	
Southwest Environmental Services	AUTOSTIK II & JR	0.1	95%	1 hr	0.05	15,000	Test time is an average. actual times based on pre-set test condition criteria
	w/ Magnetostictive Probe	0.2	See below	5 1/4 hrs	0.1	15,000	
	AUTOSTIK II & JR w/ TSP-LL2 series probe	0.1	95%	5 3/4 hrs	0.05	15,000	
	AUTOSTIK II & JR w/ SCALD 2.0	0.2	See below	< 7 hrs	0.1	30,000	
The Marley Pump Co.	Minimum product level based on tank diameter: Tank Diameter = Product Required	0.2	14%	Continuous	0.1	49,336	Throughput Restrictions/2 max. manifolded
	RLM5000, RLM5001, RLM9000	0.2	50%	Test time	0.058	15,000	
	ST1400, ST1401, ST1401L, ST1800, ST1801, ST1801L, ProLink Ultra	0.1	95%	not available	0.05	15,000	
	PROLINK	0.2	15"		0.09	73,500	
Tidel Engineering	EMS 3500	0.1	95%		0.05	73,500	All probes are magnetostictive or ultrasonic. No probe numbers available.
	EMS 2000 & EMS3000	0.2	50%		0.1	18,000	
Universal Sensors	Probe 8463 & 8473 (Magnetostictive) w/ProPlus	0.2	50%		0.1	18,000	PC Compatible
	Probe 8463 & 8473 (Magnetostictive) w/ProMax	0.1	95%		0.1	18,000	
Veeder-Root Co. Red Jacket Pro Plus & ProMax	Probe 8463 & 8473 (Magnetostictive) w/ProPlus	0.2	15%		0.1	15,000	Throughput Restrictions
	Probe 8463 & 8473 (Magnetostictive) w/ProMax	0.1	95%		0.1	15,000	
	Probe 8463 & 8473 (Magnetostictive) w/ProMax	0.2	50%		0.1	15,000	
	Probe 8463 & 8473 (Magnetostictive) w/ProMax	0.1	95%		0.1	15,000	
	Probe 8463 & 8473 (Magnetostictive) w/ProMax	0.2	90%		0.1	15,000	
	Probe 8463 & 8473 (Magnetostictive) w/ProMax	0.2	50%	5 hrs	0.1	15,000	
	Probe 8463 & 8473 (Magnetostictive) w/ProMax	0.2	50%	2 hrs	0.1	15,000	
	Probe 8463 & 8473 (Magnetostictive) w/ProMax	0.1	95%	2 hrs	0.1	15,000	
	Probe 8463 & 8473 (Magnetostictive) w/ProMax	0.2	see below	2 hrs	0.1	15,000	
	Probe 8463 & 8473 (Magnetostictive) w/ProMax	0.1	see below	2 hrs	0.1	15,000	
Veeder-Root Co. Red Jacket Pro Plus & ProMax	Probe 8463 & 8473 (Magnetostictive) w/ProMax	0.2	50%	2-5 hrs	0.1	15,000	Throughput Restrictions
	Probe 8463 & 8473 (Magnetostictive) w/ProMax	0.1	95%	2-5 hrs	0.1	15,000	
	Probe 8463 & 8473 (Magnetostictive) w/ProMax	0.2	50%	2-5 hrs	0.1	15,000	
	Probe 8463 & 8473 (Magnetostictive) w/ProMax	0.1	95%	2-5 hrs	0.1	15,000	
	Probe 8463 & 8473 (Magnetostictive) w/ProMax	0.2	50%	2-5 hrs	0.1	15,000	
	Probe 8463 & 8473 (Magnetostictive) w/ProMax	0.1	95%	2-5 hrs	0.1	15,000	
	Probe 8463 & 8473 (Magnetostictive) w/ProMax	0.2	50%	2-5 hrs	0.1	15,000	
	Probe 8463 & 8473 (Magnetostictive) w/ProMax	0.1	95%	2-5 hrs	0.1	15,000	
	Probe 8463 & 8473 (Magnetostictive) w/ProMax	0.2	50%	2-5 hrs	0.1	15,000	
	Probe 8463 & 8473 (Magnetostictive) w/ProMax	0.1	95%	2-5 hrs	0.1	15,000	

